

WE CLAIM:

1 1. Detector for a time-of-flight mass spectrometer comprising:
2 an electron multiplier, for converting a particle into a multiplicity of electrons; and
3 a scintillator, for converting the multiplicity of electrons into a multiplicity of photons;
4 whereby said detector is electro-optically isolated from a high voltage portion of the
5 time-of-flight mass spectrometer.

1 2. Detector of claim 1, further comprising a photomultiplier for converting the
2 multiplicity of photons into a corresponding second multiplicity of electrons.

1 3. Detector of claim 2, wherein said photomultiplier sums the second multiplicity of
2 electrons into a charge pulse.

1 4. Detector of claim 1, further comprising a coating on said electron multiplier selected
2 from aluminum oxide (Al_2O_3), magnesium oxide (MgO), tin oxide (SnO_2), quartz (SiO_2), barium
3 fluoride (BaF_2), rubidium tin (Rb_3Sn), beryllium oxide (BeO), diamond and combinations
4 thereof.

1 5. Detector of claim 1, wherein said electron multiplier comprises a multichannel plate.

1 6. Cartridge for the detector of claim 5, comprising a cartridge body configured to
2 receive said multichannel plate, said cartridge being readily removeable from and installable in
3 said detector.

1 7. Detector of claim 1, wherein said scintillator is configured to provide a frequency
2 bandwidth which accommodates arrival times of the multiplicity of electrons.

1 8. Detector of claim 1, wherein said scintillator is constructed from Bicron 418, Bicron
2 422b or combinations thereof.

1 9. Detector of claim 1, further comprising a coating on said scintillator configured to
2 reflect photons generated therein.

1 10. Detector of claim 1, further comprising a coating on said scintillator selected from
2 aluminum, chrome and combinations thereof.

1 11. Electron multiplier having a coating selected from aluminum oxide (Al_2O_3),
2 magnesium oxide (MgO), tin oxide (SnO_2), quartz (SiO_2), barium fluoride (BaF_2), rubidium tin
3 (Rb_3Sn), beryllium oxide (BeO), diamond and combinations thereof.

1 12. Electron multiplier of claim 11, defining a multichannel plate.

1 13. Method of detecting a particle with a time-of-flight mass spectrometer comprising:
2 accelerating the particle with a voltage;
3 converting the particle into a multiplicity of electrons with a detector of the time-of-flight
4 mass spectrometer; and
5 converting the multiplicity of electrons into a multiplicity of photons, thereby
6 electro-optically isolating the detector from a high voltage portion of the time-of-flight mass
7 spectrometer.

1 14. Method of claim 13, wherein said converting the particle is achieved with a
2 multichannel plate.

1 15. Method of claim 14, further comprising enhancing secondary electron emissivity of
2 the multichannel plate with a coating selected from aluminum oxide (Al_2O_3), magnesium oxide

3 (MgO), tin oxide (SnO₂), quartz (SiO₂), barium fluoride (BaF₂), rubidium tin (Rb₃Sn), berryllium
4 oxide (BeO), diamond and combinations thereof.

1 16. Method of claim 13, wherein the voltage ranges from -15kV to +15kV.

1 17. Method of claim 15, wherein said converting the particle is achieved with a
2 multichannel plate.

1 18. Method of claim 13, further comprising converting the photons into a second
2 multiplicity of electrons.

1 19. Method of claim 18, further comprising summing the second multiplicity of electrons
2 into a charge pulse.

1 20. Method of claim 18, wherein said converting the photons is achieved with a
2 scintillator.

1 21. Method of claim 20, wherein the scintillator is configured to provide a frequency
2 bandwidth which accommodates arrival times of the multiplicity of electrons.

1 22. Method of claim 20, wherein the scintillator is constructed from Bicron 418, Bicron
2 422b or combinations thereof.

1 23. Method of claim 20, wherein the scintillator has a coating thereon for reflecting
2 photons generated therein.

1 24. Method of claim 20, wherein the scintillator has a coating thereon selected from
2 aluminum, chrome and combinations thereof.

1 25. Detector for a time-of-flight mass spectrometer comprising:
2 an electron multiplier, for converting particles into a multiplicity of first electrons;
3 a scintillator, for converting the multiplicity of first electrons into a multiplicity of
4 photons; and
5 a photomultiplier for converting the multiplicity of photons into a second multiplicity of
6 electrons.
7 whereby said detector is electro-optically isolated from a high voltage portion of the
8 time-of-flight mass spectrometer.

1 26. Detector for a time-of-flight mass spectrometer responsive to input particles, each
2 having a corresponding mass, for producing output pulses representative of the respective masses
3 of the particles, comprising:
4 a biased input for differentially accelerating each input particle in accordance with its
5 mass;
6 a first electron multiplier, for converting the accelerated input particle into a
7 corresponding multiplicity of first electrons;
8 a scintillator, responsively coupled to the first electron multiplier for converting the
9 multiplicity of first electrons into a multiplicity of corresponding photons; and
10 a second electron multiplier responsively coupled to the scintillator for converting the
11 multiplicity of photons into a corresponding second multiplicity of electrons, said second
12 electron multiplier being electrically isolated from the scintillator.

1 27. Detector for a time-of-flight mass spectrometer responsive to input particles, each
2 having a corresponding mass, for producing output pulses representative of the respective masses
3 of the particles, comprising:
4 a biased input for differentially accelerating each input particle in accordance with its
5 mass;
6 a microchannel plate electron multiplier, for converting the accelerated input particle into
7 a corresponding multiplicity of first electrons;

8 a scintillator, responsively coupled to the microchannel plate electron multiplier for
9 converting the multiplicity of first electrons into a multiplicity of corresponding photons; and
10 a photomultiplier tube electron multiplier responsively coupled to the scintillator for
11 converting the multiplicity of photons into a corresponding second multiplicity of electrons, said
12 photomultiplier tube electron multiplier being electrically isolated from the scintillator.

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